News from the Savannah River National Laboratory

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SRS AND CLEMSON PARTNERSHIP OVERCOMES CHALLENGE TO FUTURE TANK CLOSURES

Assembled cooling coil mock-up at Clemson University.

AIKEN, S.C. — One of the challenges for future tank closures at the Savannah River Site (SRS) has been resolved, thanks to a partnership among SRS's contractor, Washington Savannah River Company (WSRC), the Savannah River National Laboratory (SRNL) and Clemson University, according to an SRNL report released last month.

Waste storage Tanks 5 and 6 at SRS are on schedule to be permanently closed in 2010. These tanks will be the first closed at SRS that have cooling coils inside them, which presents a new challenge in the tank closure work.

Closing waste tanks with capacities of 750,000 – 1.3 million-gallons involves an intricate set of steps that include emptying the waste tanks, removing as much of the waste as possible through various technologies and techniques, then filling the tanks with grout, a cement-like material using a specific formula for tank closure. This process permanently seals the tanks from future use while minimizing water infiltration over time and impending the release of stabilized contaminants into the environment.

However, the cooling coils must be filled with grout and sealed from the inside of the coils, top to bottom, to ensure that there is not a direct flow path for water from the top of the tank to the residual waste at the bottom of the tank. The grout used to fill the tanks is too thick to pump into the extensive network of cooling coils inside the tank. Therefore, SRNL was asked to develop a new grout with improved flow properties, which was needed to ensure that the coils can be completely filled without breaking the lines.

Adding to the complexity, the waste tanks are 75 feet in diameter by 25 feet deep. Each tank contains about four miles of cooling coils.

As the name implies, cooling coils can be used to cool or heat waste inside waste tanks, depending on the need and the type of waste involved.

Wyatt Clark, WSRC's Liquid Waste Operations Chief Engineer, said finding the answer to sealing cooling coils is a critical step as SRS continues to close waste tanks.

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“Closing waste storage tanks is a technical challenge from many standpoints,” Clark said. “In particular, the cooling coils represent a significant hurdle we had to clear to be successful.”

The task was to develop a grout formula with the right consistency to pump and to fill the coils, along with the right chemical properties that, once the grout had cured, would slow radionuclide release from the tank. SRNL, the applied research and development laboratory at SRS, developed such a grout formulation during the past year.

“SRNL has developed a variety of grout formulas over the years, with different characteristics needed for various purposes,” said Dave Crowley, SRNL’s Manager of Stabilization Science Programs. “Our objective for this project was to produce a grout that not only readily fills the cooling coils but also produces a durable grout with the chemical and physical properties necessary to immobilize the residual waste.”

In addition, SRNL contracted with Clemson University to build full-scale cooling coil assemblies that could be used to test the new grout formula and to demonstrate commercially available techniques for mixing and transporting the grout. The contract with Clemson comes through the South Carolina Universities Research and Education Foundation (SCUREF), a consortium of South Carolina universities that facilitates this type of research support for U.S. Department of Energy missions at SRS.

The Clemson Engineering Technology Laboratory (CETL) provided the facility and additional resources for the project. SRNL teamed with CETL to build two different full-scale cooling coil assemblies that resemble how the coils are placed in the tanks. Vertical and horizontal cooling coil assemblies were fabricated, which included all of the bends and linear piping associated with the actual coils in the SRS tanks.

The sheer size of these coil assemblies presented a major challenge to setting up the experiments. According to John Harden, CETL Project Engineer, “We were dealing with hundreds of feet of pipe that had to be assembled in a specific way to duplicate the hydraulic flow properties of the actual coils. In addition, we knew the assembly was going to get very heavy as it filled with grout.”

The solution was to section-off a portion of a parking lot and let the coils weave back and forth inside and outside the laboratory. “Fortunately, the coils are meant to be stacked, so we just built multiple layers of pipe runs on very robust support structures designed to handle that weight,” said Harden.

In April and May, SRNL conducted two separate full-scale tests at Clemson to verify that the selected grout can be processed using commercially available equipment to fill the cooling coil assemblies without exceeding the SRS process design limits. SRNL released its report last month detailing the success of the work.

This process has now been bench-tested and appears viable, with the next step to be tested in the plant.

SRS is owned by DOE and operated by a team of companies led by the Washington Savannah River Company, a subsidiary of URS Washington Division. SRNL puts science to work supporting DOE and the nation in the areas of energy security, national and homeland security, and environmental management, including serving as the DOE Office of Environmental Management’s corporate laboratory, supporting engineering and technology for cleanup and waste management across the DOE complex.